

Development and Characterization of a Transferable Insensitive Explosive (TIE):  
A Formulation System Suitable for a Wide Range of Applications

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A Transferable Insensitive Explosive (TIE) formulation with unique rheological properties and LX-17 performance has been developed, scaled-up for production, and fully characterized. The formulation, RX52AE, is a paste explosive consisting of TATB, an energetic fluorinated plasticizer, and PCL/PVF polymers. The TATB used has a trimodal particle size distribution to optimize the solids loading into the paste matrix. Rheological studies indicate that this paste formulation may be transferred efficiently through small diameter orifices without shear thinning and fill cavities without voids at temperatures down to -25 C. A cured-in-place version of the TIE, RX52AD, yielded no physical separation or expansion in the filled cavity. Performance and initiation sensitivity characterization of RX52AD and RX52AE were performed using the LLNL copper cylinder expansion test and electric gun slapper initiation, respectively. The performance of RX52AE was similar to that of LX17, and the initiation sensitivity was slightly higher than TATB filled formulations. The increase initiation sensitivity is attributed to the slight increase in heterogeneity due to the trimodal TATB particle size distribution. The run-distance to detonation, determined by dynamic loading experiments in a gun geometry, was similar to that of TATB at input pressures below 100 kbars, and similar to HMX at pressures above 110 kbars. This distribution in run-distance to detonation suggest that the initiation mechanism changes as a function of pressure. The paste matrix proves to be a robust host for a variety of monomolecular explosives, such that the performance of the explosive formulation may be tailored while maintaining its transferable property.

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